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SEASONAL OUTLOOK

ICE CONDITIONS

IN

NORTHERN CANADIAN WATERS

PREPARED BY
ICE FORECASTING CENTRAL
OTTAWA

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NOTE: Figures 1, 6 and 11, the observed ice conditions, have been simplified to a certain extent from the originals in the interest of clarity.

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1972 SEASONAL OUTLOOK OF ICE CONDITIONS

IN

NORTHERN CANADIAN WATERS

1. INTRODUCTION

For several years an outlook of the expected break-up pattern in the Canadian Arctic has been prepared each spring with the intention of providing a planning guide for use in the broad approach to scheduling resupply operations. The outlook is based on a series of aerial reconnaissance flights in mid April, a more detailed coverage in mid May, daily satellite pictures since early April, weekly ice thickness measurements at many sites during the winter and an analysis of wind and temperature conditions since the 1971 freeze-up.

This Outlook is not intended for operational use for, in general, the detail required will not be provided. It is hoped, however, that it will provide guidance as to the deviations from a normal break-up and a fore-warning of troublesome areas during the summer navigation.

2. GENERAL SEASONAL OUTLOOK

The 30-day Weather Outlook issued by the U.S. National Weather Service for mid May to mid June indicated below normal temperatures from Baffin Island to Point Barrow with much below readings from Coronation Gulf to Mould Bay and Isachsen and normal readings in West Greenland and Southern Hudson Bay. At the end of May it was apparent that these departures had, in general, occurred as predicted.

The June forecast indicates a similar temperature pattern with much below normal temperatures from Frobisher to Mould Bay and Isachsen and below normal readings elsewhere except for James Bay. A low is expected in Southern Davis Strait and a high to be centered north of Barter Island.

As a result a normal season is expected in the Western Arctic with the pack retreating to a moderate distance offshore in the Beaufort Sea.

In the Eastern Arctic a severe winter and a cool spring are expected to produce a late and incomplete clearing in Baffin Bay with particularly difficult conditions in Home Bay. Access to Parry Channel via the Greenland coast will develop in July but more than normal obstructions are expected in the Eureka-Alert area.

Unfavourable winds and cool temperatures will produce a late breakup in Foxe Basin and retreat of the ice in Hudson Bay will be retarded although access to Churchill by early vessels will be difficult at first.

3. ANALYSIS OF INITIAL ICE CONDITIONS

3. (a) Western Arctic Supply Routes

In the autumn of 1971 the coastal waterway east of Cape Bathurst had become icefree before freeze-up commenced. West of Cape Bathurst to Barter Island the pack edge retreated to the north of latitude 71N but patches of very open ice intermittently moved closer to the coast. A well defined shore lead did not develop along the Alaska coast from Barter Island to Point Barrow, hence there were areas of very open to open pack Old ice in the coastal area when freeze-up began. A significant shoreward ice drift did not develop during the freeze-up period and consequently no high concentrations of Old ice should be found in the coastal area. Similarly in Queen Maud Gulf all ice present this spring should be First Year ice formed during this past winter.

During the winter the resultant wind-induced drift was toward the southeast in the Beaufort/Amundsen area. This southeastward drift occurred only during January, February and March - after a substantial cover of ice had developed - and while considerable pressure will have occurred in the coastal area, ice along the coast should be mostly First Year ice. A more southward resultant drift in Victoria Strait was again evident only in January, February and March, and as ice had already consolidated, no Old ice should have drifted into Queen Maud Gulf.

The winter along the coastal route from MacKenzie Bay to Queen Maud Gulf was slightly colder than average with accumulations of Freezing Degree Days from 300 to 700 higher than normal. Ice thickness measurements in the area indicate a normal 6-7 foot ice cover throughout.

3. (b) Parry Channel

Extensive clearing of Viscount Melville Sound occurred last year prior to the autumn freeze-up, and Barrow Strait had almost completely cleared. Lancaster Sound was free of sea ice but M'Clure Strait retained a close ice cover throughout the season. Much of the ice from M'Clure Strait drifted eastward into Viscount Melville Sound during the freeze-up period. During the early stages of freeze-up only a minor efflux of Old ice from Byam Martin Channel was observed and consequently eastern Viscount Melville should have a high proportion of First Year ice, particularly in the north portion. Barrow Strait and Lancaster Sound will have insignificant amounts of old ice (if any).

The temperature regime during the winter varied from near normal over M'Clure Strait to a 10-15 percent greater than normal accumulation of Freezing Degree Days over Lancaster Sound. Ice thickness measured at Mould Bay was average for the winter while at Resolute it was slightly less than average.

3. (c) Eastern Arctic Waters - including Jones Sound to Eureka

Davis Strait and Baffin Bay cleared by October 1971 except for a few Old floes in central Baffin Bay. Intermittent drift of Old ice from

Nares Strait was occurring during the freeze-up period. Jones Sound became almost icefree and, at its best, southern Norwegian Bay had reduced to very open to open pack. Freeze-up began early in September in Eureka Sound and this area should be mostly First Year ice which is up to 10 percent thicker than normal because of a colder winter. The ice in Jones Sound and Norwegian Bay should be thicker than normal for the same reasons. Farther west among the Queen Elizabeth Islands a closer to average winter was experienced and a more normal ice cover should have developed.

In the Baffin Bay/Davis Strait area a much colder than average winter resulted in accumulations of Freezing Degree Days from 10-20 percent higher than normal. Ice drift through the winter was generally from north to south, relatively weak in Baffin Bay but considerably stronger south of Cape Dyer. In the Home Bay area the wind-induced drift had a slight onshore component. Consequently a heavy cover of ice is present in Baffin Bay with numerous strips or floes of Old ice which have drifted southward during the winter months. In the Cape Dyer area and southward a more dispersed ice cover should have developed and because of greater than average "spreading" of the pack the thickness of the ice may be less than average, despite the colder winter.

3. (d) Foxe Basin

A few strips of Old ice persisted in Foxe Basin when freeze-up commenced. The winter in Foxe Basin has been the coldest since continuous observations began in 1957. The accumulation of Freezing Degree Days to the end of May was over 11,300, 14 percent higher than average. Coral Harbour at the southern end of the Basin was also colder with the comparable Frost Degree Day anomaly of 10 percent. The resultant wind-induced ice drift during the winter has been very light. Ice thickness measured at Hall Beach was 85 inches by early May. This is 8 inches thicker than average. Consequently a uniform cover of First Year ice, heavier than normal, exists in Foxe Basin. Mean winds in the area were light, however, and topography is expected to be considerably less than is usually the case.

3. (e) Hudson Bay Route

Hudson Bay, Hudson Strait and adjacent waters were free of sea ice when freeze-up commenced last autumn. The winter was extremely cold over Labrador Sea, Davis Strait and Hudson Strait. Hudson Bay was also colder than normal every month during the winter but the anomalies here were not as great. Over western and southern Hudson Bay a southeastward wind-induced drift occurred through January, February and March while during the remainder of the winter, and over northeastern Hudson Bay throughout, the wind-induced drift was light. Over eastern Hudson Strait and Labrador Sea this drift factor was strong, persistent and from the north or northwest. This, combined with the extremely cold winter, resulted in one of the greatest areal coverages of ice on record in the southern Davis Strait/Labrador Sea area. At latitude 60N for a great part of the winter ice extended from the Labrador coast to near longitude 53W. One result of this spreading should be a lower than average thickness of the ice, but the rate and pattern of disintegration will depend on the early

summer temperature and wind regime. First Year ice throughout the remainder of the area should be heavier than average and extensive ridging should be expected in areas such as Ungava Bay, James Bay and Southern Hudson Bay.

4. OBSERVED ICE CONDITIONS AND DETAILED OUTLOOK

4. (a) Western Arctic Supply Routes

This area was not observed visually in April. Satellite pictures indicated the only opening as a flaw lead from MacKenzie Bay eastward beyond Cape Bathurst then north along the west coast of Banks and Prince Patrick Islands.

Observation in May showed Amundsen Gulf and the waterway eastward as consolidated First Year ice, almost completely snowcovered and with relatively light pressure features. Indications of the lead west of Banks Island persisted but from Cape Bathurst westward the lead had closed, with nine tenths First Year and one tenth younger growth stages outside the coastal fast ice. A narrow lead with New ice was reported 50 miles north of Herschel Island that extended westward at least to Barter Island. No Old ice was reported in the coastal area.

Earlier (in March) U.S. Navy reports along the Alaskan coast included one to two tenths of Old ice embedded in both the coastal fast ice and the offshore pack. The pack, as expected was very close or consolidated with floes in giant size range.

During late May the Cape Bathurst Polynya began to develop and at the end of the month a continuous 5-10 mile flaw lead extended from near Herschel Island to Cape Kellett and M'Clure Strait. Despite below normal temperatures in June favourable southeasterly winds are expected to expand the lead slowly and allow break-up to progress eastward into Amundsen Gulf. The fast ice will remain in position beyond mid June however.

Continued offshore drift in July and break-up of the fast ice will permit navigation to Sachs Harbour, Barter Island and Clinton Point by mid month and the coastal waterway into Coronation Gulf will have heavily puddled ice. Clearing to Cambridge Bay is expected by the end of the month and navigation along the Alaskan coast is also expected to become feasible at this time.

Extension of navigation to Shepherd Bay is expected by mid August and continued good conditions are expected along the whole coastal route through September. The polar pack is not expected to retreat as far seaward as in 1971 but a good year for navigation in the eastern Beaufort Sea is forecast.

4. (b) Parry Channel

The April flight observed eastern Barrow Strait and Prince Regent Inlet, as well as eastern Lancaster Sound. The observed areas east of

90W and in Prince Regent Inlet north of 7320N had a high proportion of Grey, Grey-White and New ice while west of 90W consolidated ice was predominantly First Year. Similarly eastern Lancaster Sound as observed varied from three to six tenths First Year ice with the remainder of the close pack cover being in the 'younger' stages of growth. A flight at the beginning of May showed the central area of Lancaster Sound as very close ice, mostly First Year, but the lighter areas both east and west were still present.

The May Round Robin flight showed a much expanded area of open water or New ice in northern Prince Regent Inlet and western Lancaster Sound. Resolute approaches remained consolidated First Year ice, snow covered and with a few Old floes in western Barrow Strait. Viscount Melville Sound and M'Clure Strait were consolidated, with a predominance of Second and Multi Year ice except along the coast of Melville Island and south of Prince Patrick Island.

During June northeast winds will permit steady clearing of Lancaster Sound as the polynya north of Prince Regent Inlet expands eastward and the North Water extends southward from Ellesmere Island to the entrance to the Sound. Limited breakup of Eastern Barrow Strait is expected by mid June but the remainder of the Channel to the west will remain consolidated.

Clearing of Barrow Strait as far as Cornwallis Island is expected by mid July but there will be only minor extension of break-up at this stage. Clearing will reach Resolute by mid August. There will be some reduction in concentration south of Bathurst Island and the remainder of the channel will reduce from consolidated to close pack ice. Navigation to Melville Island will remain congested however.

More significant improvement in western Parry Channel is expected in September with a reduction to open pack ice along the north side as far as M'Clure Strait. There will be slight southward movement through Byam Martin Channel but no serious intrusion of Old ice into Viscount Melville Sound is expected.

4. (c) Eastern Arctic Waters

The April Round Robin flight observed only an area from north-western Norwegian Bay to near King Christian Island which was consolidated and predominantly Old ice, while Penny Strait and Queen's Channel, though still consolidated, were covered by 70 percent First Year ice and 30 percent Old ice. Satellite pictures indicated openings or disruptions of the ice cover only in Hell Gate and Cardigan Strait, and in the Lady Ann Strait approach to Jones Sound. In Nares Strait several observations through the winter and also the Round Robin flight showed the northern limit of the "North Water" at 7840N. Southward lay a broad area of New, Grey and Grey-White ice but with a preponderance of First Year ice south of 7630N. Baffin Bay, generally, was very close or consolidated pack through the Western side of the bay but looser and some younger ice was reported in southeastern Baffin Bay. Satellite pictures indicated a further weakening of the ice along the Greenland coast with a broad area of light or very loose ice off Upernavik. In Davis Strait 20-40 percent of the ice was reported as Grey-White or Grey ice, with an even higher proportion off Cape Dyer, confirming the more rapid ice drift in this area than in Baffin Bay.

In May, Eureka Sound and Northern Norwegian Bay were observed as consolidated First Year ice with a few Old ice floes scattered throughout. In southeastern Norwegian Bay ice was 40-60 percent Old ice, consolidated except east of Graham Island where ice remained very close pack. In Smith Sound and Northern Baffin Bay the North Water was well developed, with additional open water or 'well fractured' ice areas east of Devon Island and in the entrance to Lancaster Sound. In Western Baffin Bay ice cover remained very close pack, mostly First Year, with fairly extensive ridging and hummocking and all large size floes. In the eastern side of the bay, south of 73N, broad coastal leads, reduced concentrations with some brash and small floes were reported. In Davis Strait the favourable indications observed in April persisted, with the ice edge beginning its westward retreat, and with a broad opening from Cumberland Sound southward.

From satellite pictures the only indications of developing openings among the Queen Elizabeth Islands were in the Hell Gate and the Penny Strait areas. The progression of lead development along the west coast of Greenland through May could be seen, and intermittent flaw leads from Cape Dyer southward and in Home Bay were evident.

Below normal temperatures and east to southeast winds are expected through June and the expansion of the North Water although narrowed as a result is expected to reach Lancaster Sound about mid month. The winds will assist development of the West Greenland lead and it is expected to reach latitude 75N at this time. Congestion will continue over the remainder of Baffin Bay particularly along the Baffin coast.

Easy access to Lancaster Sound through open pack off Melville Bay is expected by mid July but more than normal amount of ice will remain in Baffin Bay. Southward drift will permit significant clearing south of Cape Dyer by this time and the remainder of the summer there will have open water.

Clearing of Eureka Sound will be underway in mid August when open pack is expected but congestion will persist in Norwegian Bay and in Greely Fiord. In Baffin Bay slow southward extension of the clearing trend will leave close pack ice in Home Bay with open pack to the north as far as latitude 74N.

Eureka Sound will have achieved its best conditions by mid September with refreezing just beginning. At best, Norwegian Bay will remain congested by close old and first year ice throughout the month although moderate to good navigation conditions are expected in the first half of September in Eureka Sound and Greely Fiord.

Nares Strait will remain congested through this period and some southward flow to Cobourg and Devon Islands is expected to develop about mid September.

In Baffin Bay the ice of Home Bay will finally reduce to open pack but there will be increasing proportions of old ice as melting of the

first year floes progresses more rapidly. Difficult navigation conditions are expected to continue until late in the month.

4. (d) Foxe Basin

During the April flight the Hall Beach polynya was not present, and the Basin was covered by very close First Year ice with the normal fast ice among the islands and shallow coastal areas. Only in the final week of April did the polynya begin to show on satellite pictures, and a smaller than usual polynya was observed at the beginning of May. The May flights did not cover Foxe Basin but satellites confirm the gradual expansion of the Hall Beach polynya, and also showed an area of dispersed ice developing from Vansittart Island along the coast of Southampton Island to Seahorse Point. Based on the April observation the ice in the central and southern basin is quite heavily ridged and hummocked despite the minimum drift vectors indicated during the winter.

Northerly winds and much below normal temperatures are expected in June and only gradual development of break-up is expected as a result. Congested ice conditions - except for the Hall Beach polynya will continue through July and even by mid August substantial areas of close pack ice is expected on the route to Hall Beach. Clearing will continue slow through to mid September and even at this time an open shipping route into the northern Basin is not expected.

4. (e) Hudson Bay Route

In April the ice in eastern Hudson Strait, through the north side of the Strait and through much of northern Hudson Bay showed evidence of disruption and recent new growth, with high percentages of Grey and Grey-White ice in many areas. The remainder of the Strait and the bay were very close ice, mostly First Year, and with areas of heavy ridging and hummocking. Outside Hudson Strait the eastern edge of the pack lay east of longitude 55W.

During the May flight broad open leads or areas of very open ice were seen throughout the north side of Hudson Strait. Both the aerial observation and satellite pictures showed a developing lead along the west coast of the Bay. Along the east side of the bay ice between the coast and the island chain through the Belchers, Sleeper and Ottawa Islands remained consolidated. Break-up was more advanced in southern James Bay. Outside Hudson Strait the eastern edge of the ice had receded to near longitude 59W.

Light northwest winds and below normal temperatures are forecast for June and this represents a change from winds with a slight easterly component. Leads from the Belchers to the Ottawa Islands are forecast to close and redevelop in the Coral Harbour Chesterfield Inlet sector. Consolidated ice will remain in the eastern part of the bay through mid June.

Continued expansion of the leads in the northwestern sector is expected through July with open water extending from Churchill to Seahorse Point at the end of the month.

In Hudson Strait, the broad leads along the south Baffin coast will expand slowly but congested ice will persist in the eastern approaches through most of June. By mid July this ice will be reduced to very open pack but there will also be open pack at the western exit because of ice drift through Foxe Channel. In late July very open to open pack in this latter area will make early access to Churchill rather difficult.

Gradual clearing will continue through August with an open water route developing in the second week of the month. Final clearing of ice in Southern Hudson Bay is expected to be delayed until mid September - about 3 weeks later than normal.

KEY TO ICE SYMBOLS

PREDOMINANT AGE

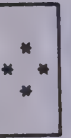
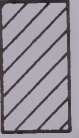
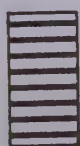
First Year
(fy)Multi Year
(my)
Second Year
(sy)Medium Floe
or greater
(>300 ft.)Small Floe
or smaller
(<300 ft.)Grey White
(gw)Grey
(g)New and
Nilas
(n)

1-3/10

4-6/10

7-9+/10

10/10



OPEN WATER

FAST ICE

CONCENTRATION AND SIZE BY AGE

Tenths of each Age

Tenths of Medium Floe or Greater

$$\frac{C_{my} C_{sy} \cdot C_{fy} C_{gw} C_g C_n}{N_{my} N_{sy} N_{fy} N_{gw} N_g N_n}$$

$$\text{Example } \frac{20.3410}{1 \ 23}$$

2- 2/10's Multi Year of which

1 1/10 is Medium Floe or greater

0 - No Second Year

. - Decimal Point

3- 3/10's First Year of which

2 2/10 is Medium Floe or greater

4- 4/10's Grey White of which

3 3/10's is Medium Floe or greater

1- 1/10 Grey, no Medium Floe or greater

0 - No New

TOTAL

CONCENTRATION

SNOW COVER

 $\frac{S_n}{(n)}$

(n) tenths on ice

SURFACE FEATURES

 $\frac{S_n/R_a R_d H_y P_d T_h + F}{(n)}$

Hummocks

(n) number of tenths

STAGE OF MELTING

Pd

(n) Th + (n) F

(n) = tenths on ice

(n)th = tenths thaw holes

(n)F = tenths frozen

TOPOGRAPHY

 $\frac{\Delta}{(n)}$

Rafted Ice

 $\frac{\Delta\Delta}{(n)}$

Ridged Ice

ICE OF LAND ORIGIN

 Δ - (n) Icebergs

 \square - (n) Bergy Bits
and growlers

Optional:

(n) - number in area

THICKNESS OF ICE AND SNOW

 $\frac{T \ S}{n \ n}$

(n) - nearest inch

WATER FEATURES



Crack



Lead



Polynya

UNDERCAST



Limits

BOUNDARY

Observed
visuallyObserved by
radar

Assumed

Limit of
Observed dataLimit of
radar data

Symbols used for Recording the Various Ice, Snow, and Water Features

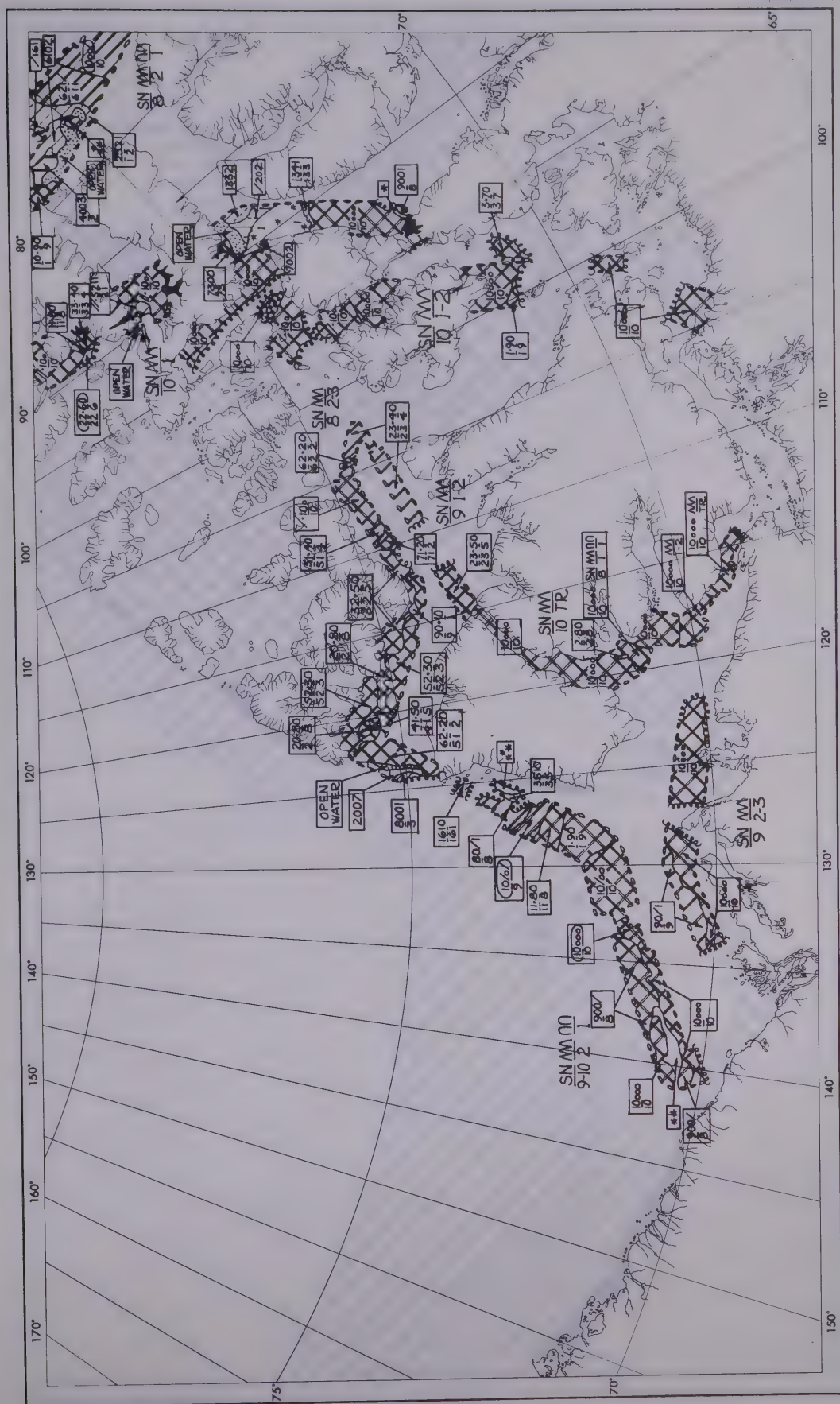


FIG. 1 OBSERVED ICE CONDITIONS 23-28 MAY

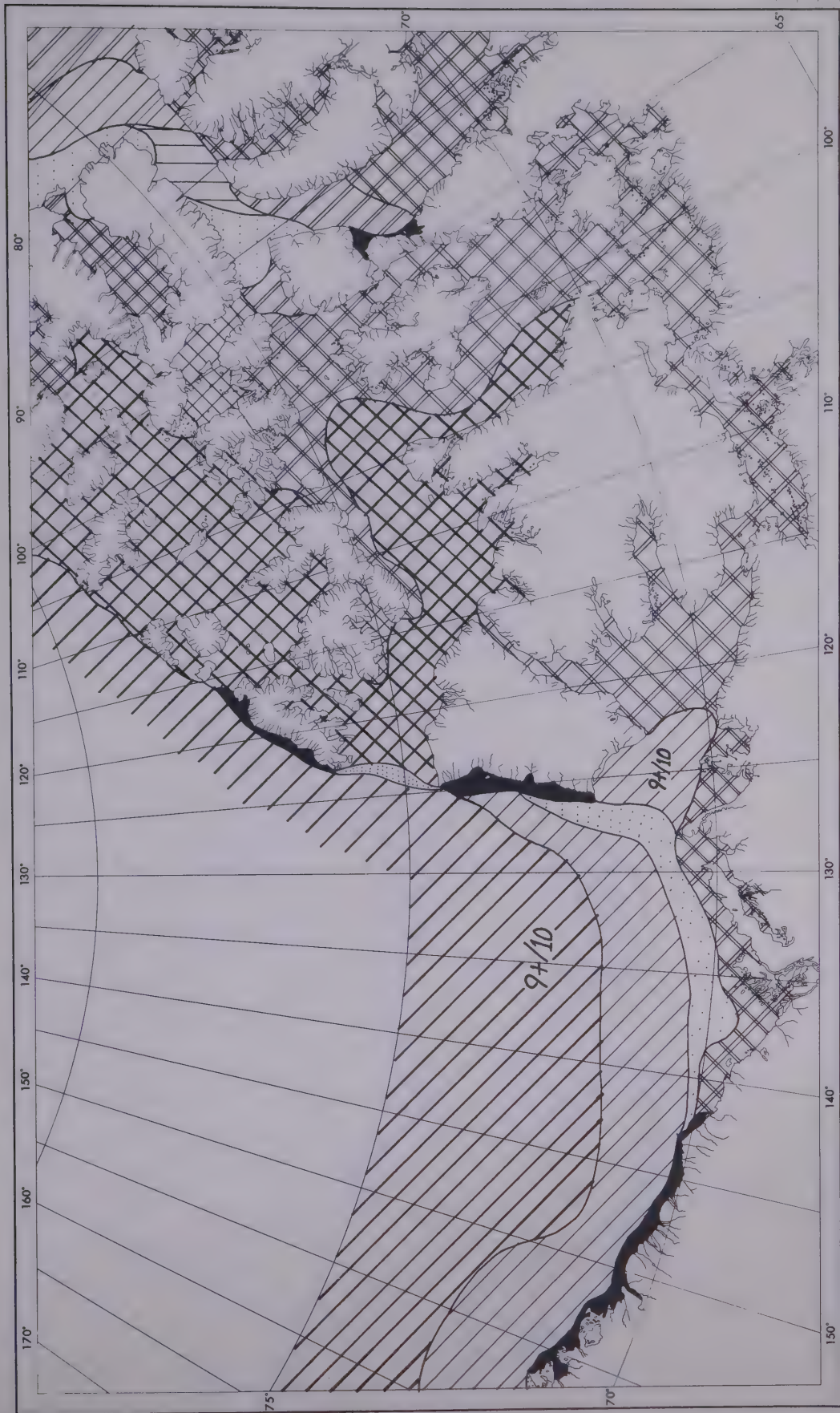


FIG. 2 FORECAST ICE CONDITIONS MID JUNE

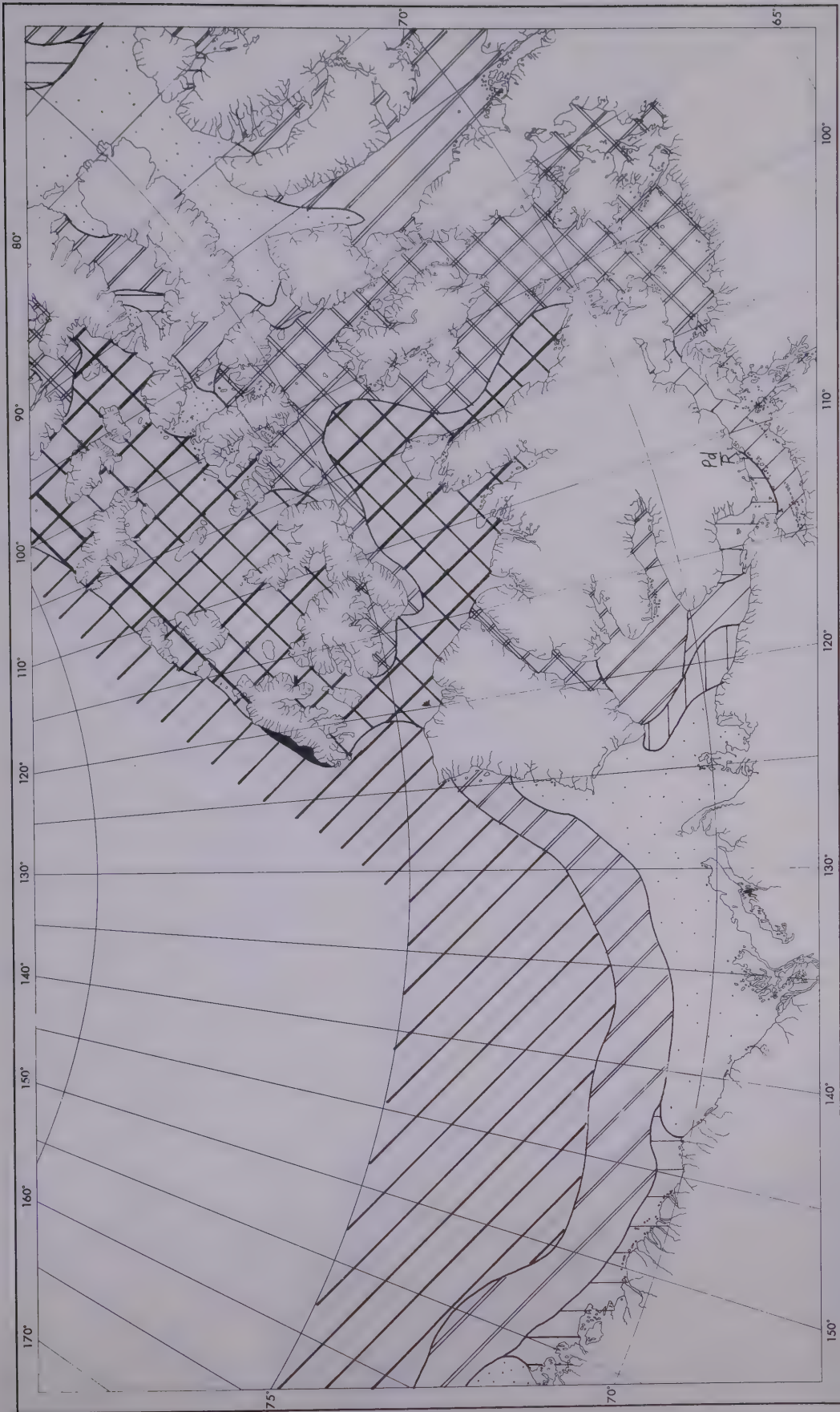


FIG. 3 FORECAST ICE CONDITIONS MID JULY

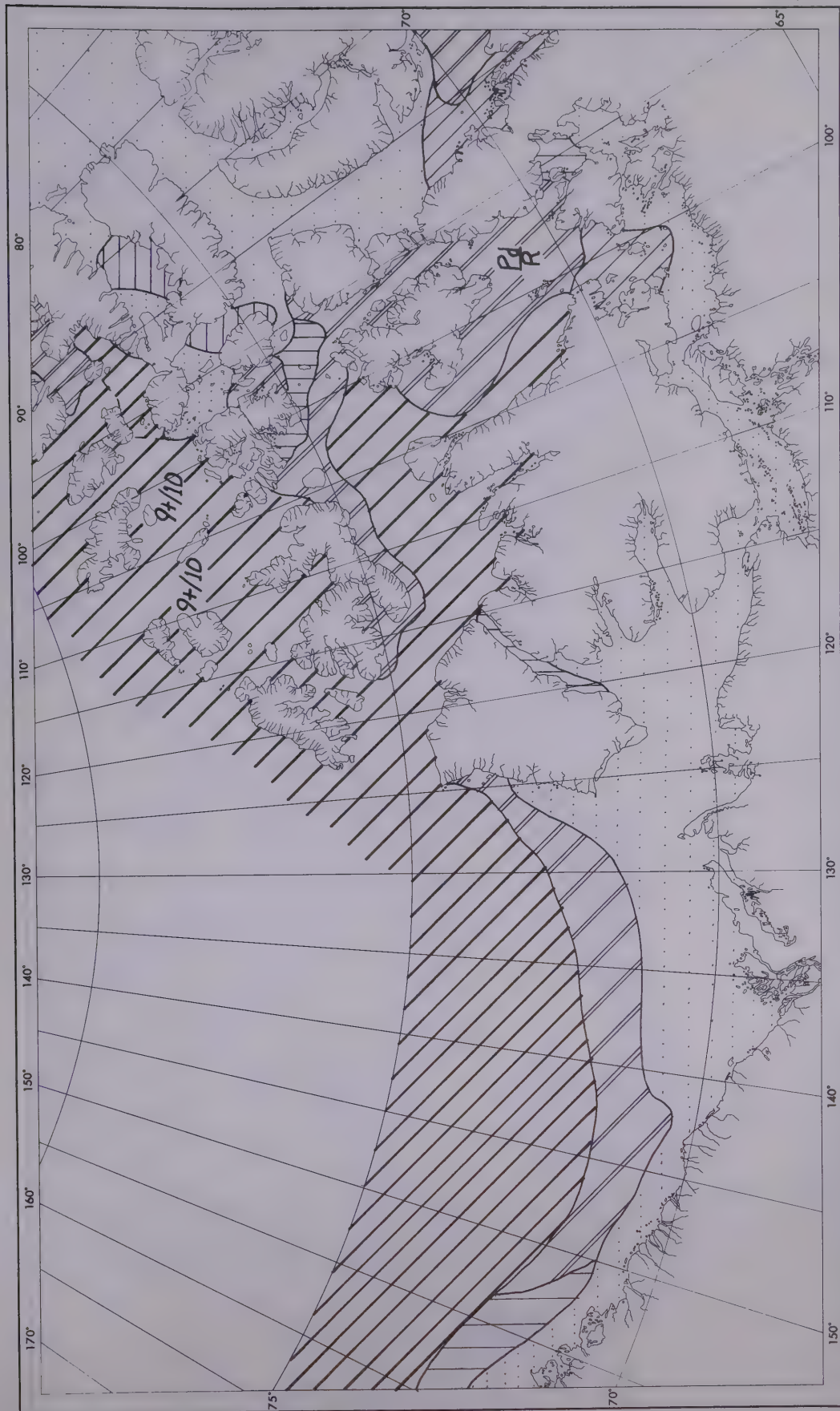


FIG. 4 FORECAST ICE CONDITIONS MID AUGUST

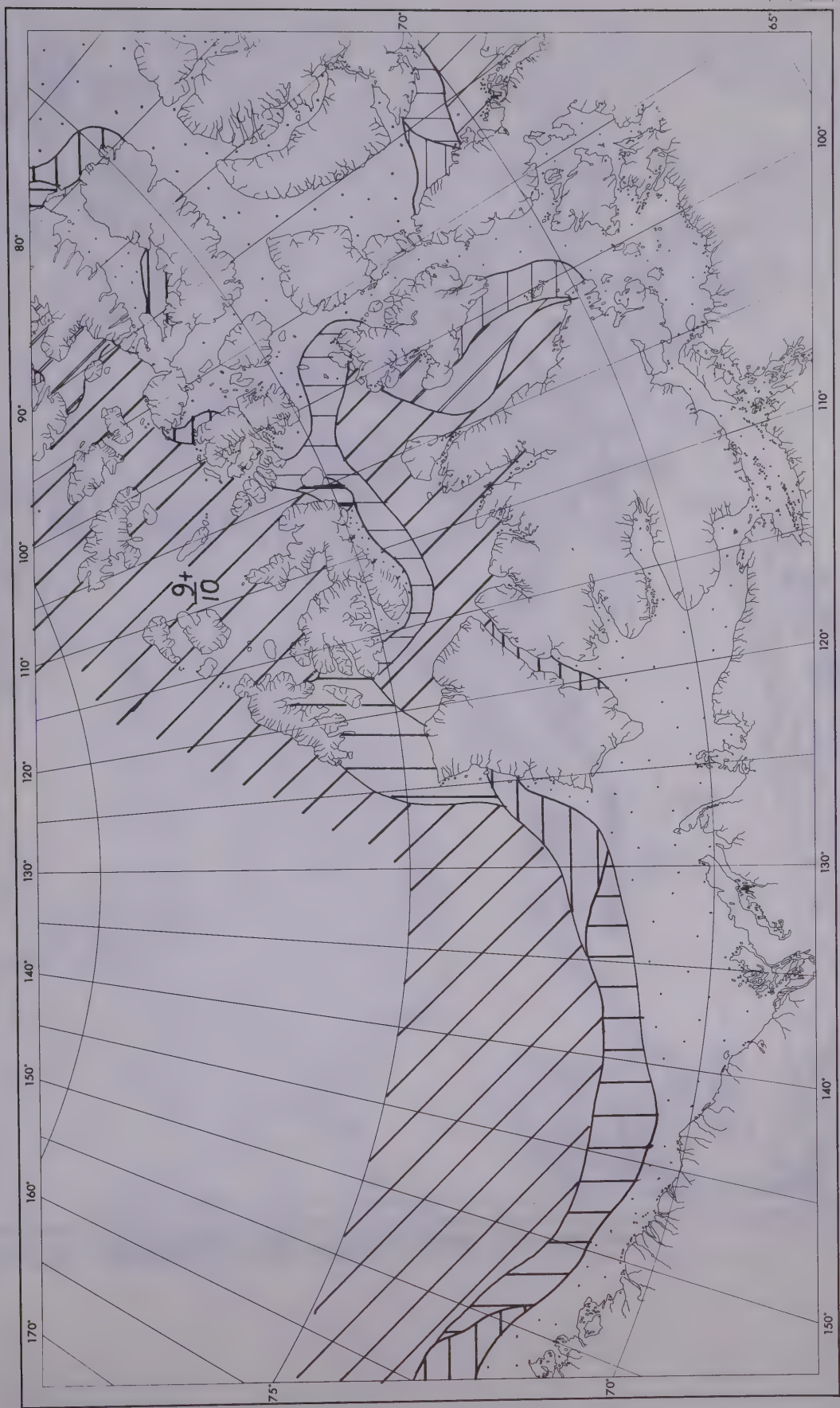


FIG. 5 FORECAST ICE CONDITIONS MID SEPTEMBER

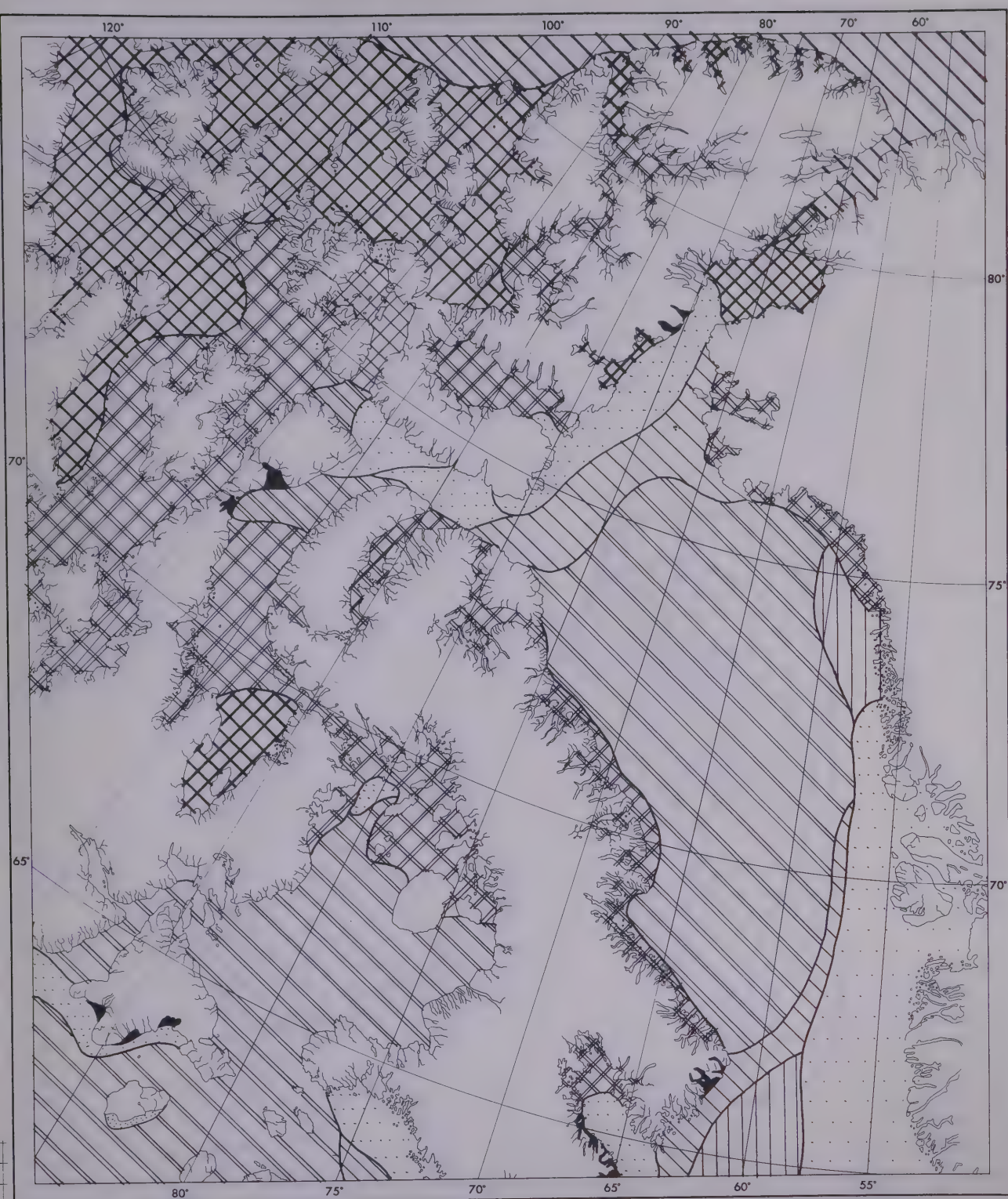


FIG 7. FORECAST ICE CONDITIONS MID-JUNE

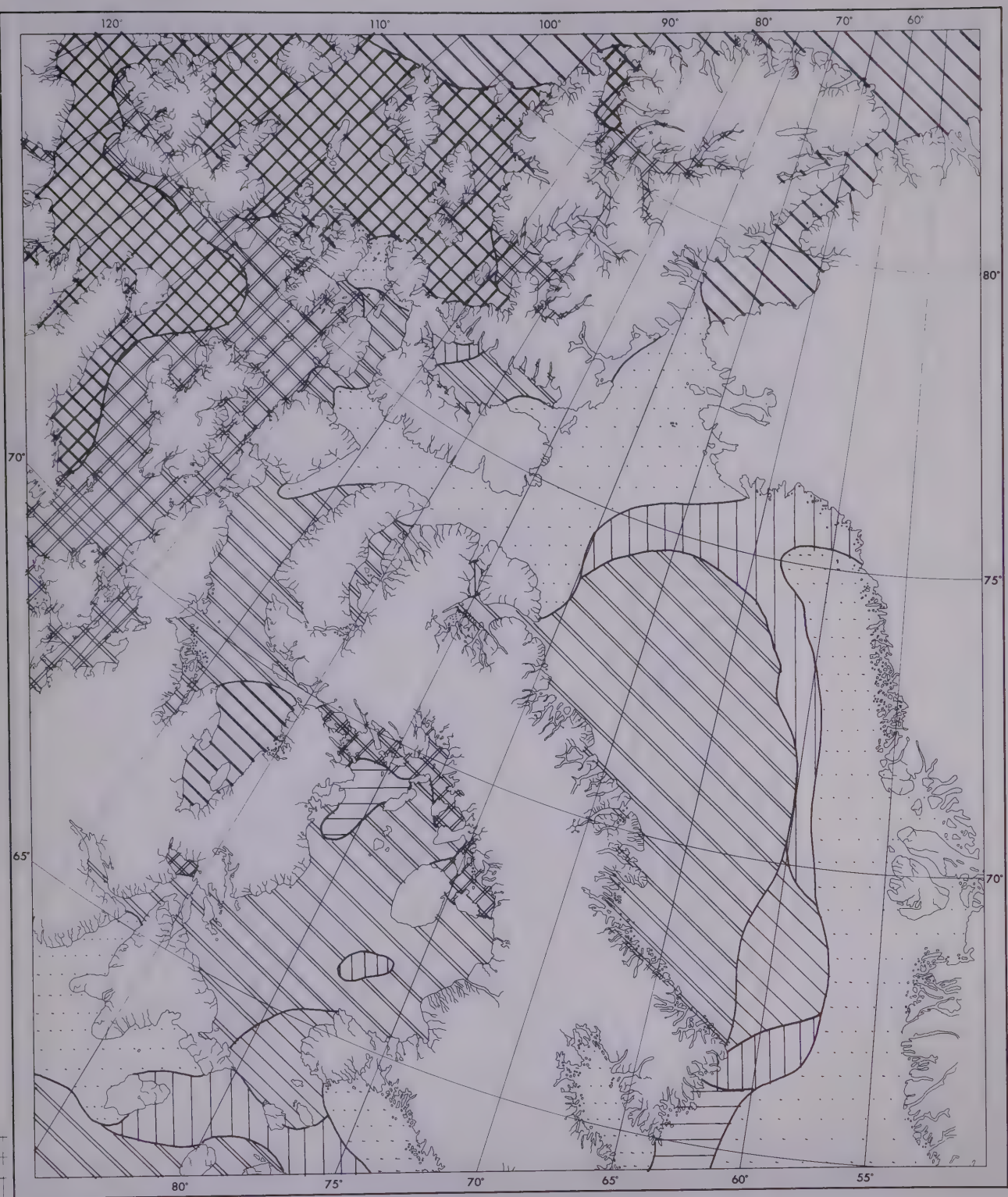


FIG 8. FORECAST ICE CONDITIONS MID-JULY



FIG 9. FORECAST ICE CONDITIONS MID-AUGUST

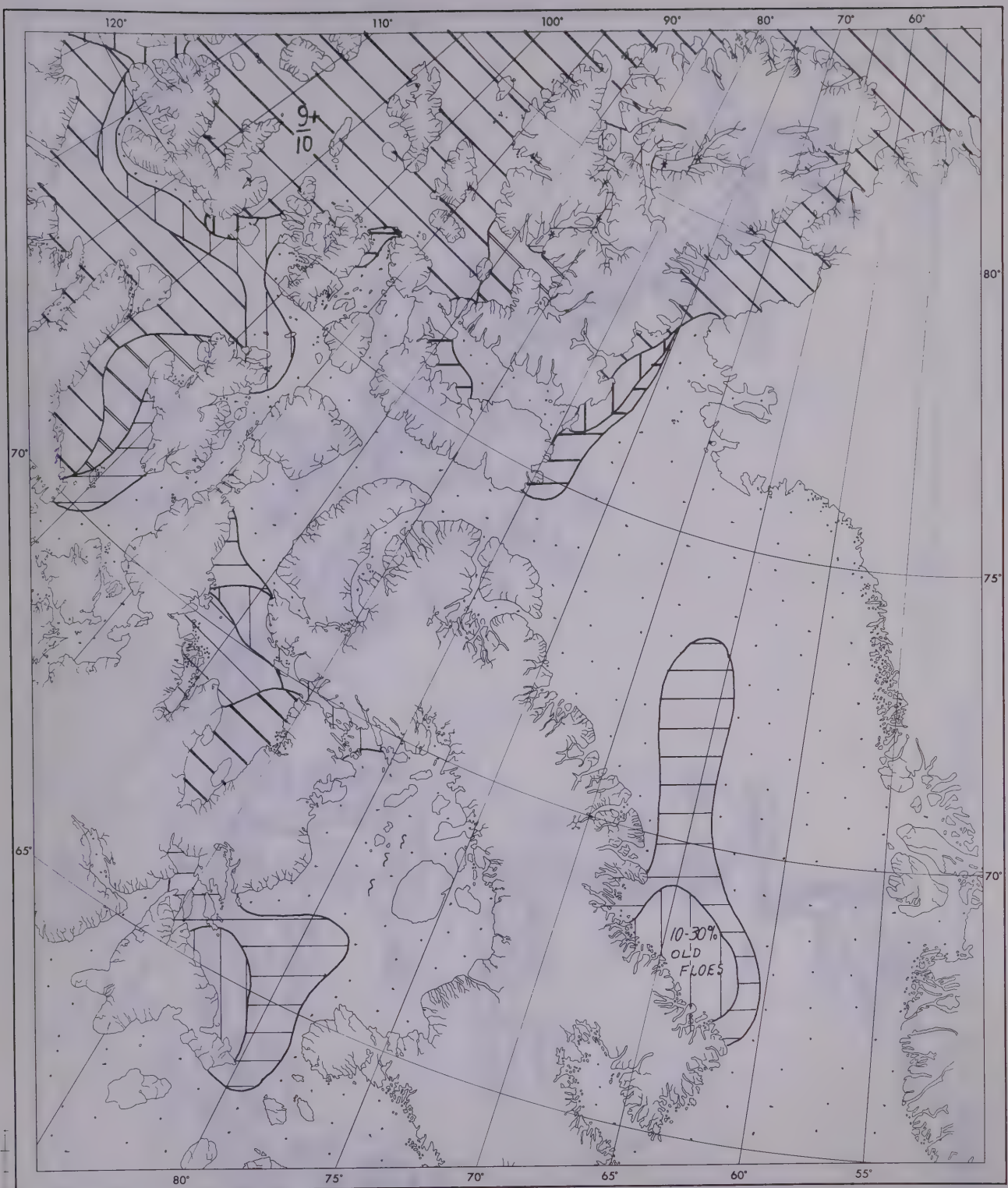


FIG 10. FORECAST ICE CONDITIONS MID-SEPTEMBER



FIG. 11 OBSERVED ICE CONDITIONS 19-21 MAY

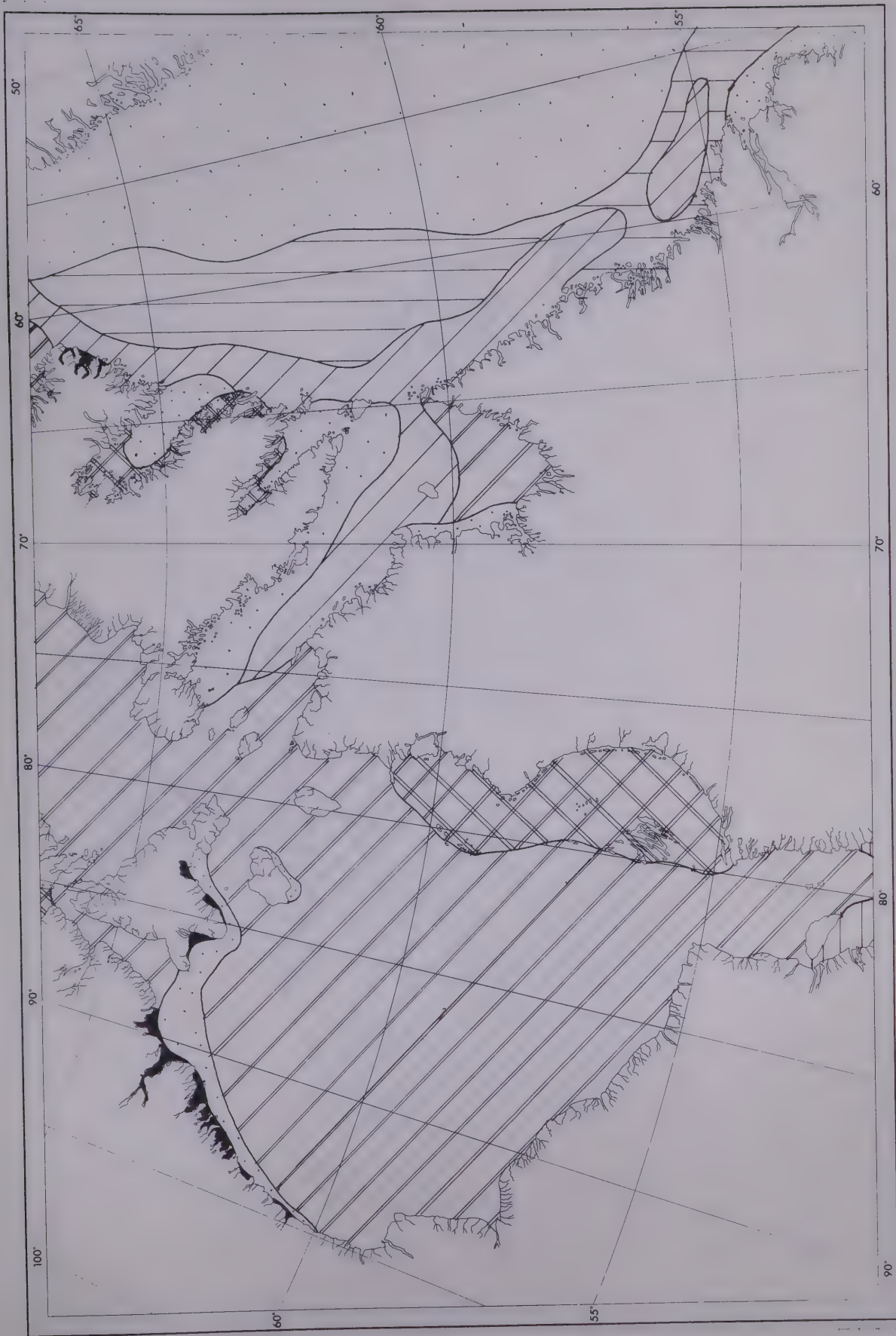


FIG 12. FORECAST ICE CONDITIONS MID-JUNE

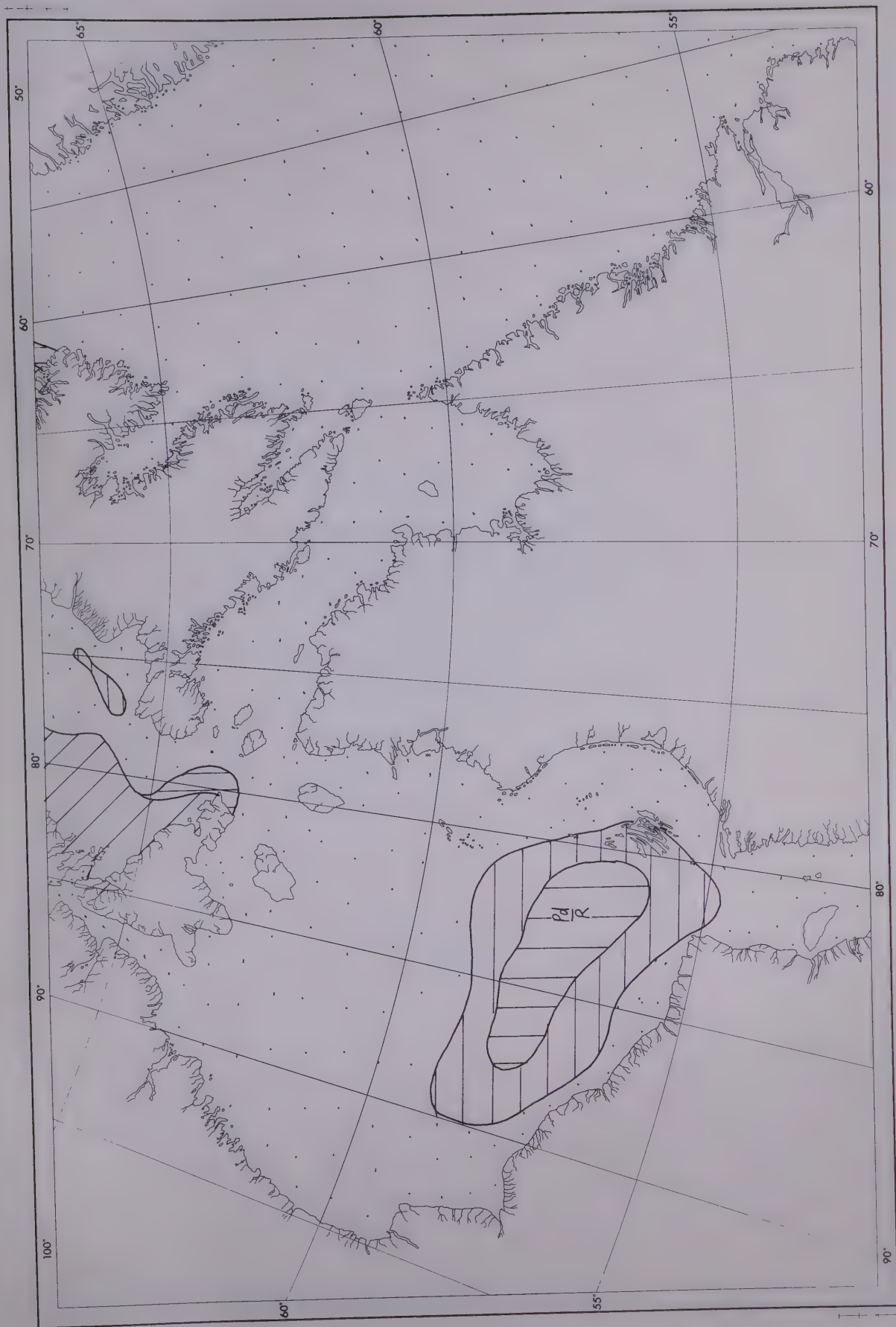


FIG. 14 FORECAST ICE CONDITIONS MID AUGUST



FIG. 15 FORECAST ICE CONDITIONS MID SEPTEMBER

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Environment Canada.

AUTHOR Atmospheric Environment Services

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